

REMARKS

Claim Objections

Examiner has objected to claim 43 because “source points” lacks an antecedent basis. Applicant has canceled claims 42-50, thereby rendering Examiner’s objection moot.

Claim Rejections

Examiner has rejected claims 1-10, 12, 29, 30, 34-37, and 42 as being anticipated by Price et al (U.S. Patent No. 6,760,407) and rejected claims 11, 13, 14-23, 24-26, 28, 31-33, and 54-60 as being rendered obvious by Price in combination with other references (Gravelle, Brettschneider, and Jones). Applicant addresses Examiner’s rejections below. Examiner has also rejected claims 42-50 as being anticipated by Zhou et al. (US 2004/0213378); Applicant’s cancelling of claims 42-50 renders Examiner’s arguments moot.

Before addressing Examiner’s substantive rejections, Applicant provides a technical review of the foundational reference, Price, in light of the claimed embodiments. Referring to Figures 5-7, Price discloses a cathode assembly 74 that emits electrons to produce an electron beam 82. Price’s cathode assembly has a curved surface 80, which “provides a focusing mechanism for the electron beam 82 and preferably has a shape that is optimized in accordance with the geometry of the beam and therefore the desired focal spot.” See Column 4, line 66-Column 5, line 5. Price therefore uses the surface shape of the cathode to focus the electron beam, tailoring the surface shape to the specific application. Price does not disclose the use of, or requirement for, any other focusing element between the cathode and anode.

Regarding the physical structure of the cathode, the cathode has a substrate 86, an insulating layer 90 that connects the cathode gate film conductors 92 to the substrate 86, and cones 94 positioned on the substrate surface 86 and in the spaces between the cathode gate film conductors 92. A plurality of slits 84 provide a passage through which electrons are emitted from the cathode surface. The spaces have dimensions on the order of 1-3 microns or less. In operation, a bias voltage is applied to the gate film 92 to establish an electric field that causes the cones 94 to emit electrons.

In Price, electrons are emitted from the cones and directed through the passage defined by the gate films 92. The gate films are physically connected to the substrate upon which the

cones are positioned, thereby creating several discontinuous electron emitting regions. As a result, electrons from one cone cannot pass through the gate films aligned with a different cone. Therefore, the gate films only have the ability to extract electrons from a cone to which the gate film is adjacent and no other cone. As previously mentioned, once the electrons pass the gate film, they are focused and directed to the anode by virtue of the cathode's curved surface.

Numerous differences exist between the Price cathode and Applicant's invention. Applicant addresses two of those differences here. First, Price's cathodes use discontinuous electron emitter regions that are not in physical communication with each other. Conversely, Applicant's invention places extraction elements, typically wires or other members, in a plane that is spaced from, and parallel to, the electron emitter. By manipulating the electrical potential of these individual extraction elements, Applicant's invention can direct electrons from one electron source region (the space defined by two adjacent extraction elements and the electron emitter) to another electron source region. See, e.g., page 9, line 4 to page 10, line 2 and Figure 3. From a utility perspective, this difference is very meaningful. Unlike Price, Applicant's invention provides for a greater focusing of electrons by permitting electrons from one source region to be preferentially directed to another source region using a controller that appropriately sets the electrical potential of the relevant extraction elements. Price does not have this ability.

Second, Price's cathode relies on the curvature of the cathode surface to focus the emitted electrons. Applicant's invention provides for a far more flexible and dynamic approach to focusing the emitted electrons. Specifically, Applicant uses focusing elements in a plane that is spaced from, and parallel to, the plane within which the extraction elements are positioned. By manipulating the electrical potential of these focusing elements, Applicant's invention can direct electrons from one position to another position, thereby focusing the electrons on a predetermined focal point. Applicant's approach is dynamic and not limited based upon an unchanging surface that locks in, and limits, the focusing range of the device.

In that light, Examiner's use of Gravelle in combination with Price to render claims 14-23 and 31-33 obvious is misplaced. Gravelle's approach to focusing cannot be combined with Price to yield Applicant's invention. Price's cathode surface structure inherently limits the focusing range and provides for the focusing capability. Gravelle's focusing system is simply not needed in Price and, even if used, cannot move electrons from various emitting regions to other emitting regions to provide for an increased focusing capability. Simply stated, the two systems

are not compatible.

To make the stated differences between the claimed embodiments and the prior art clearer, Applicant has amended the pending claims in the following manner. First, Applicant has clarified the nature of its extraction/emitter structure to make it clear that, unlike Price, the area between the extraction elements and electron emitter is a contiguous space. Second, Applicant has clarified that the controller, through the use of electrical potentials, can cause the movement of electrons from one source region to another—a structural feature that is simply not possible in the discontinuous design of Price.

Applicant believes the present application is now in the form for allowance and respectfully requests issuance of a Notice of Allowance.